

REMARKS

Claims 1-7 and 9-13 are pending in this application.

Applicants respectfully request reconsideration of the rejection of claims 1-7 and 9-13 under 35 U.S.C. § 103(a) as being unpatentable over *Brofman et al.* (U.S. Patent No. 5,968,670) in view of *Evans et al.* (U.S. Patent No. 5,632,434). As will be explained in more detail below, the combination of *Brofman et al.* in view of *Evans et al.* does not raise a *prima facie* case of obviousness against the subject matter defined in independent claim 1.

In support of the obviousness rejection, the Examiner alleges that it would have been obvious to one having ordinary skill in the art at the time of the invention “to replace the solder encapsulant with a polyamide in order to ensure a strong joint (see Evans col. 1, ll. 10-45) and to modify the method of Brofman to utilize the temperature range in order to ensure the solder is completely reflowed (see Brofman col. 7, ll. 1-20).” Final Office Action at page 3.

Applicants respectfully traverse the obviousness rejection as being improper because the requisite suggestion to combine the references in the manner proposed by the Examiner is lacking. In particular, nothing in the *Evans et al.* reference would have provided one having ordinary skill in the art with a motive to modify the expandable solder bumps means shown in *Brofman et al.* to include a polyamide instead of solder. The *Evans et al.* reference describes a device for attaching an electronic component to a substrate. The pertinent portion of the *Evans et al.* reference relied upon by the Examiner states as follows: “Attachment of chips to substrates on multichip modules and hybrid packages is generally accomplished with adhesives (epoxies, polyimides), hard solders (AuSi, AuSn), or flip-chip solder bumps (PbSn). Hard solders offer considerable thermal, mechanical, and electrical advantages over adhesives and flip-chip processes.” *Evans et al.* at column 1, lines 39-44. The *Brofman et al.* reference discloses a flip-chip application that uses expandable solder bumps. The only material suggested in the *Evans et al.* reference for use in flip-chip solder bumps is PbSn. As such, even

if it is assumed that the *Evans et al.* reference is properly combinable with the *Brofman et al.* reference (a proposition with which Applicants disagree), nothing in the *Evans et al.* reference would have motivated one having ordinary skill in the art to replace the expandable solder bumps shown in the *Brofman et al.* reference with a polyimide.

The Examiner's obviousness rejection is premised on the alleged interchangeability of solder and polyimide taught in the *Evans et al.* reference. Applicants respectfully submit that the Examiner has mischaracterized the teachings of the *Evans et al.* reference in this regard. The above-quoted sentence in the *Evans et al.* reference merely lists a variety of materials that have been used in different packaging applications, i.e., adhesives, hard solders, and flip-chip solder bumps. Regarding adhesives, the materials cited by *Evans et al.* include epoxies and polyimides, and Applicants would agree that the *Evans et al.* reference establishes that epoxies and polyimides are equivalent adhesives for purposes of packaging applications in which chips are mounted to substrates on multichip modules and hybrid packages *using adhesives*. Applicants respectfully disagree, however, that the *Evans et al.* reference establishes the interchangeability of solder and polyimide for purposes of the claimed subject matter. The *Evans et al.* reference merely cites polyimides as exemplary adhesives that have been used in packaging applications that use adhesives. On the other hand, the focus of the claimed subject matter is the elongation of a solder joint using an expander, which is encapsulated by an encapsulant. In the *Brofman et al.* reference, the encapsulant is a solder material, and the *Brofman et al.* reference goes to great lengths to describe the multiple fabrication steps required to form the casted solder encapsulant. The *Evans et al.* reference has nothing at all to do with the formation of elongated solder joints. As such, nothing in the *Evans et al.* reference would have provided one having ordinary skill in the art with a motive to replace the solder encapsulant shown in the *Brofman et al.* reference with another material, much less a polyimide.

In the Advisory Action dated June 28, 2006, the Examiner responded to the arguments set forth above by stating “[i]t appears that applicant has too narrowly construed the teachings of Brofman. Brofman involves soldering connections involving multichip modules, where ‘one or more integrated circuit chips are mounted above a single or multiple’ chip or board (Brofman, col. 1, ll. 20-40). As stated in the Final Rejection, it is the examiner’s position that because Evans teaches the use of an epoxy in a multichip module and that the use of an epoxy is one of several different vehicles to attach chips to a substrate, it would have been obvious to one of ordinary skill in the art at the time of the invention to replace the solder with polyamide to ensure a strong joint (see Evans col. 1, ll. 10-45).” Advisory Action at page 2.

Applicants agree with the Examiner that the *Brofman et al.* reference relates to soldering connections involving multichip modules. Nevertheless, the characterization of the *Brofman et al.* reference is not the deciding factor in assessing the alleged obviousness of the claimed subject matter. Instead, the obviousness issue hinges on whether the *Evans et al.* reference would have motivated one having ordinary skill in the art to modify the *Brofman et al.* reference in the manner proposed by the Examiner, and whether the combination would have resulted in the claimed subject matter.

Applicants respectfully submit that nothing in the *Evans et al.* reference would have motivated one having ordinary skill in the art to modify the *Brofman et al.* reference in the manner required to obtain the claimed subject matter. Assuming for the sake of argument that the *Evans et al.* reference would have provided a suggestion to use polyimide instead of solder, a person having ordinary skill in the art would not have obtained the claimed subject matter because such person would have substituted polyimide for both the solder joints (see reference number 10 in Figure 2A) and the solder in the expandable solder bumps (see reference number 14 in Figure 2A). In other words, the substitution “taught” by *Evans et al.* would join the substrates with polyimide instead of solder joints. In contrast, the claimed subject matter

includes solder joints and an elongator for expanding the solder joints, with the elongator including an expander and a thermoplastic encapsulant to encapsulate the expander. The general teaching regarding the use of polyimide in the *Evans et al.* reference would not have provided one having ordinary skill in the art with any motivation to replace the solder in the expandable solder bumps of *Brofman et al.* with polyimide, yet maintain the solder in the solder joints. As such, the combination of *Brofman et al.* in view of *Evans et al.* would not have resulted in the claimed subject matter.

In summary, it is axiomatic that an obviousness rejection based on combination of references is proper only if the prior art would have suggested to one having ordinary skill in the art the desirability of combining the references in the proposed manner. The result of the combination also must include all of the features of the claimed subject matter. Here, for at least the reasons set forth above, the *Evans et al.* reference would not have suggested to one having ordinary skill in the art the desirability of replacing the solder encapsulant shown by *Brofman et al.* with a thermoplastic material such as a polyimide. Further, as explained above, the result of this combination would not include all of the features of the claimed subject matter. As such, for at least the foregoing reasons, the combination of *Brofman et al.* in view of *Evans et al.* does not raise a *prima facie* case of obviousness against the subject matter defined in independent claim 1.

Accordingly, independent claim 1 is patentable under 35 U.S.C. § 103(a) over the combination of *Brofman et al.* in view of *Evans et al.* Claims 2-7 and 9-13, each of which depends directly or indirectly from claim 1, are likewise patentable under 35 U.S.C. § 103(a) over the combination of *Brofman et al.* in view of *Evans et al.* for at least the same reasons set forth above regarding claim 1.

In view of the foregoing, Applicants respectfully request reconsideration and reexamination of claims 1-7 and 9-13, and submit that these claims are in condition for

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allowance. Accordingly, a notice of allowance is respectfully requested. In the event a telephone conversation would expedite the prosecution of this application, the Examiner may reach the undersigned at **(408) 749-6902**. If any additional fees are due in connection with the filing of this paper, then the Commissioner is authorized to charge such fees to Deposit Account No. 50-0805 (Order No. AGSGP010).

Respectfully submitted,
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A handwritten signature in black ink, appearing to read 'P. Martine', with a stylized flourish at the end.

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